REMARKS

Claims 19-28, 30, 31, 33-37 and 39-41 are pending in this application.

Applicant is surprised at the failure of the last Office Action to acknowledge that the limitation "organo-metallic-atomic deposited titanium-silicon-nitride layer" is simply not a product-by-process limitation, but rather a *resulting structure* having defined and distinct characteristics.

Applicant reaffirms that the limitation "organo-metallic-atomic deposited titanium-silicon-nitride layer" describes the product more by its structure and not by its process. As noted in the previously-submitted Amendment in response to Office Action, in R2 Medical Systems, Inc. v. Katecho, Inc., which involved a claim reciting that one element be "affixed" to another, the court found that "'affixed' means 'to be attached physically.'" R2 Medical Systems, Inc. v. Katecho, Inc., 931 F.Supp. 1397, 1425-26 (N.D. Ill. 1996). The Court held that "[T]he terms of the claims do not indicate that 'affixed' refers to a process by which the stannous chloride is bound to the conductive plate, but only that it refers to the result of that process." Id. (quoting CVI/Beta Ventures, Inc. v. Custom Optical Frames, Inc., 893 F. Supp. 508, 519 (D. Md. 1995) (limitation that element be in 'work-hardened pseudoelastic metallurgic state' is directed to the structure, not the process, of manufacture)).

In re Garnero involved a patent claim which recited "expanded perlite particles which are interbonded one to another by interfusion between the surfaces of the perlite particles while in a pyroplastic state to form a porous perlite panel." In re Garnero, 412 F.2d 276, 162 USPQ 221 (CCPA 1969). The Court of Customs and Patent Appeals held that "interbonded . . . by interfusion" should be interpreted as a structural rather than a process limitation. Id.

Similarly, in Hazani v. U.S. Int'l Trade Comm'n, which involved patent claims to a memory cell comprising a conductive plate having a surface that was "chemically engraved," the Federal Circuit also held that the claims were "pure product claims" and

not product-by-process claims. Hazani v. U.S. Int'l Trade Comm'n, 126 F.3d 1473, 44 USPQ2d 1358 (Fed. Cir. 1997). The Federal Circuit reasoned that the "chemically engraved" limitation, read in context, described the product more by its structure rather than by the process used to obtain it. Id.

In interpreting Hazani, the Office Action asserts that "[t]he limitation of 'chemically engraved' however, is not so much a limitation on how the 'first plate' was made but on how it was treated or processed *subsequent* to its formation." (Office Action at 7, emphasis in original). The Office Action concludes that as "the court looked to the specification to determine what weight to give the limitation 'chemically engraved,'" the court "found that 'chemically engraved' meant 'textured with asperities'" and further "found that the process of chemically engraving was not structurally different from the prior art." (Office Action at 7).

While Applicant agrees in part with the above-cited statement of the last Office Action, Applicant notes that the court in Hazani did not determine at what point during the capacitor formation was the "chemically engraved" limitation conducted. Accordingly, the court in Hazani did not determine that the "[t]he limitation of 'chemically engraved' . . . was treated or processed *subsequent* to its formation," as the Office Action mistakenly asserts. (Office Action at 7, emphasis in original). Rather, the court looked at the specification of the '904 patent which "describes the 'chemically engraved' surfaces as 'textured with asperities' as a result of oxidation. *See* '904 patent, col. 7, lines 47-51 ("the floating gate 30's surface is oxidized . . . such that mainly the top surface of layer 30 . . . is textured with asperities")." Hazani, 126 F.3d at 1479. Since "Kuo similarly discloses a conductive plate and states that a surface of the conductive plate adjoining the insulator may be textured with asperities. *See* Kuo, col. 4, lines 41-43 ('Asperities, or roughness, of the polysilicon-dielectric interfaces are relied upon to decrease the erase voltages to reasonable levels.')," the court concluded that "surfaces that have asperities of the sort produced by oxidation, are identical for all relevant purposes to the product described by Kuo." Id. Notably, the court also considered an "affidavit from Dr. Caywood attesting to the fact that one of ordinary skill in the art would conclude that the asperities associated

with oxidation are the same as those disclosed in Kuo."

In the present case and in view of Hazani, it is clear that a court would not look at whether "organo-metallic-deposited" refers "to a treatment applied to the Ti-Si-N layer *after* it is formed," as the Office Action mistakenly asserts. In addition, Applicant notes that the specification of the present invention teaches the improved characteristics of the "organo-metallic-atomic deposited titanium-silicon-nitride layer." For example, the specification mentions that "Min et al. have demonstrated that Ti-Si-N films deposited by an organo-metallic atomic layer deposition (ALD) method prevent the diffusion of copper at temperatures up to 800°C for about 60 minutes." (Application at 9, lines 23-25). The specification also emphasizes that "[t]he Ti-N-Si films formed by the above-described ALD technique prevent the diffusion of copper at temperatures up to 800°C for about 60 minutes, and provide a step coverage of about 100%." (Application at 10, lines 3-5). In this manner, "[a]s the aspect ratio of via/trench increases, maintaining a good step coverage is particularly important for the Ti-Si-N diffusion barrier layer 72 deposited especially on the sidewalls of the via 65 and trench 67." (Application at 10, lines 5-8).

Achieving "near-perfect step coverage" and "control[ling] precisely the thickness and composition of grown films" by metal-organic atomic-layer deposition is also the crux of Min et al. in *Metal-organic atomic-layer deposition of titanium-silicon-nitride films*, Appl. Phys. Lettrs., Vol. 75, No. 11, pp. 1521-23 (1999), the disclosure of which was incorporated by reference in the present application. As emphasized by Min et al., "the MOALD (metal-organic atomic-layer deposition) process has great potential for excellent step coverage on severe surface topography due to the complete surface reaction" particularly for Ti-Si-N films with less than 10nm thickness. Id. at 1523. Accordingly, a person skilled in the art would conclude that the properties of the Ti-Si-N film associated with the metal-organic deposition of the present invention are different from the properties of a Ti-Si-N film formed by chemical vapor deposition, for example.[1] Thus, the limitation

[1] Applicant also notes that chemical cases follow the well-established Papesch doctrine, according to which evidence of unobvious or unexpected advantageous properties may rebut a *prima facie* case of obviousness based on structural similarities. Such evidence may

"organo-metallic-atomic deposited titanium-silicon-nitride layer" of independent claim 19 is a structural limitation and not a product-by-process limitation. An "organo-metallic-atomic deposited titanium-silicon-nitride layer," like the "chemically engraved" plate of Hazani, is a *resulting structure* having distinct and defined characteristics.

Applicant maintains all remarks and arguments with respect to the anticipation and obviousness rejections of the pending claims in this application, as set forth in detail in the last Amendment dated March 21, 2003. In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

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Respectfully submitted,

By _____

Thomas J. D'Amico
Registration No.: 28,371
Gabriela I. Coman
Registration No.: 50,515
DICKSTEIN SHAPIRO MORIN & OSHINSKY LLP
2101 L Street NW
Washington, DC 20037-1526
(202) 785-9700
Attorneys for Applicant

include data showing that the compound is unexpectedly superior in a property it shares with prior art compounds.